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Test Plan Sodium Dimethyldithiocarbamate

CAS Registry Number 128-04-1

Rubber and Plastic Additives Panel
American Chemistry Council
December 2003

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List of Member Companies in the Rubber and Plastic Additives Panel

The Rubber and Plastic Additives Panel of the American Chemistry Council includes the following member companies: Alco Chemicals, Bayer Polymers LLC, Ciba Specialty Chemicals Corporation, Crompton Corporation, Eliokem, Inc., Flexsys America L.P., The Goodyear Tire & Rubber Company, The Lubrizol Corporation, Noveon, Inc., and R.T. Vanderbilt Company, Inc.

Summary

The member companies of the American Chemistry Council's Rubber and Plastic Additives Panel (RAPA) hereby submit for review and public comment their test plan for sodium dimethyldithiocarbamate (SDMC; CAS no. 128-04-1) under the High Production Volume (HPV) Chemical Challenge Program.

SDMC is used as a water treatment chemical; it precipitates heavy metal ions from water. It is used in the rubber industry to stop quickly the polymerization of synthetic (SBR) latexes. It is also a registered biocide for cutting oils and aqueous systems such as leather tanning and paper manufacturing.

Existing data for this compound indicate that it is of low concern for mammalian toxicity but toxic to most aquatic organisms. SDMC is of moderate concern for skin irritation and allergic skin reaction.

The RAPA Panel concludes that there are sufficient data on SDMC to meet the requirements of the HPV Chemical Challenge Program and no additional testing is recommended.

Aquatic Toxicology. SDMC is toxic to aquatic organisms. There are several studies on SDMC, and while results vary they indicate the potential hazard of this product. The 48-hr EC_{50} for *Daphnia* is 1.5 ppm; the 96-hr LC_{50} for rainbow trout was 0.85 mg/l in one study and 6.7 mg/l in a second study. The 96-hr LC_{50} for bluegill sunfish was 3.3 mg/l in one study and 38.5 mg/l in a second. The 96-hr LC_{50} for Sheepshead minnows was 60.1 mg/l. The 96-hr

EC50 for algae (*Chlorella pyrenoidosa*) is 0.8 mg/l.

SDMC is biodegradable; the main breakdown products are tetramethyl thiuram mono- and disulfides which, in turn, break down in water.

Acceptable data are available on toxicity to algae, toxicity to aquatic invertebrates, toxicity to fish and biodegradability. The data warrant handling the product as an environmentally hazardous substance. Adequate data exist in SIDS endpoints, so no additional ecotoxicity testing is proposed.

Acute Toxicity: The acute oral and dermal LD₅₀s for SDMC are >2000 mg/kg; the acute inhalation LC₅₀ is >2.05 mg/l for four hours. Since acceptable data are available on three routes of exposure, no additional acute toxicity testing is proposed.

Mutagenicity: Several genetic toxicity studies have been conducted on SDMC. In an Ames assay, SDMC was mutagenic in three strains of *Salmonella* (TA 100, TA 1535 and TA 1537). However, no genotoxic effects were observed in a rat liver unscheduled DNA synthesis assay. Based on this data the RAPA Panel concludes that SDMC is weakly mutagenic to bacteria but not mutagenic to mammalian cells *in vitro* and that no additional mutagenicity testing is warranted.

Repeated Dose Toxicity: A 90-day dermal toxicity study in rabbits was performed on SDMC. Dermal irritation was observed at dosing site in mid- and high-dose group animals. There was no histologic evidence of systemic toxicity in any group of animals. White blood cell and platelet count were reduced at the high dose level.

An 18-month chronic toxicity and carcinogenicity study in mice was conducted on a close structural analogue, sodium diethyldithiocarbamate. The results of this study were classified "equivocal." Oral administration of the test compound at the maximum tolerated dose resulted in an elevation of tumor incidence in an uncertain range. The positive control chemicals produced the expected incidence and types of tumors in the test animals. The study authors suggest that either additional statistical evaluation and/or experimentation would be required before a more exact interpretation can be made.

A two-year chronic toxicity and carcinogenicity study in rats and mice was conducted on a close structural analogue, sodium diethyldithiocarbamate. No tumors occurred in either rats or mice of either sex at incidences that were significantly higher in dosed animals than in controls. The study concluded that sodium diethyldithiocarbamate is not carcinogenic to rats or mice of either sex.

These data are acceptable to characterize the subchronic and chronic toxicity of SDMC for the HPV Chemical Challenge Program. No additional subchronic or chronic toxicity testing is proposed for SDMC.

Reproductive and Developmental Toxicity: Developmental toxicity studies on SDMC have been conducted with rabbits and rats. In both cases the No Observed Effect Level (NOEL) for

maternal toxicity was lower than the NOEL for developmental toxicity. A multi-generation rat reproductive toxicity study on a close structural analogue, sodium monomethyldithiocarbamate (Metam sodium) has also been conducted. Metam sodium (43.148% w/w) was given in drinking water at 0, 0.01, 0.03 or 0.10 mg metam sodium/ml to Alpk:APfSD rats (30/sex/dose) for two generations. The parental systemic NOEL was 0.01 mg/ml; decreased food consumption, water consumption and body weight in both sexes of both parental generations were observed at 0.1 mg/ml. Females in the F1 parental generation also showed a decrease in water consumption at 0.03 mg/ml. Histopathology in the nasal cavity was reported (Bowman's duct hypertrophy with loss of alveolar cells, disorganization/degeneration/atrophy of olfactory epithelium, hyperplasia of olfactory epithelium and dilatation of ducts of Bowman's glands) at 0.1 mg/ml. The parental reproductive NOEL is greater than 0.1 mg/ml; there were no significant reproductive effects at any dose. The pup NOEL was 0.03 mg/ml; pups showed a tendency at 0.1 mg/ml to have decreased body weight from day 22 (males) in the F1a generation and from day 5 (males) in the F2a generation.

These studies provide evidence that SDMC is not a selective or specific reproductive or developmental toxin. No additional reproductive or developmental testing is proposed for these materials.

Conclusion: The physical, chemical and toxicological properties of sodium dimethyldithiocarbamate have been considerably studied. A detailed hazard analysis can be made with the data available; additional studies would not significantly change what is already known about this product. Therefore, the RAPA Panel concludes that there are sufficient data on this compound to meet the requirements of the HPV Chemical Challenge Program and recommend no additional testing.

Background Information: Manufacturing and Commercial Applications

Manufacturing

SDMC has been manufactured world wide for over 60 years. It is manufactured by batch rather than continuous process. SDMC is manufactured by combining dimethylamine with carbon disulfide in a solution of sodium hydroxide, forming the water-soluble dithiocarbamate salt.

Commercial Applications

SDMC is used to precipitate heavy metal ions from water. As a free-radical inhibitor, it is used in the rubber industry to stop quickly the polymerization of synthetic (styrene-butadiene rubber, or SBR) latexes. It is also used as a biocide for cutting oils and aqueous systems such as leather tanning and paper manufacturing.

Worker/Consumer Exposure

The majority of SDMC is used for water treatment, where only sophisticated industrial users handle this material. Most large industrial users have mechanized materials handling systems, so exposure is generally minimal. The greatest potential for skin and inhalation exposure is at

the packing station at the manufacturing site and, to a somewhat lesser degree during weighing activities at the customer site.

SDMC is regulated for use in food-contact applications by the Food and Drug Administration as follows.

21 CFR 177.2600, Rubber articles intended for repeated use: As accelerator, not to exceed 1.5% by weight of rubber product.

21 CFR 176.300, Slimicides.

21 CFR 175.105, Components of Adhesives.

21 CFR 173.320, Chemicals for controlling microorganisms in cane-sugar and beet-sugar mills.

SODIUM DIMETHYLDITHIOCARBAMATE (SDMC) Test Plan

CAS No. 128-04-1

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Physical-Chemical					
Melting Point	Boiling Point	Vapor Pressure	Partition Coefficient	Water Solubility	
A	A	Calc	Calc	A	
Environmental Fate					
Photodegradation	Stability in Water	Transport/ Distribution		Biodegradation	
Calc	A	Calc		A	
Ecotoxicity					
Acute Toxicity to Fish		Acute Toxicity to Aquatic Plants (e.g., Algae)		Acute Toxicity to Aquatic Invertebrates (e.g., <i>Daphnia</i>)	
A		A		A	
Mammalian Toxicity					
Acute Toxicity	Bacterial Genetic Toxicity <i>In Vitro</i>	Mammalian Genetic Toxicity <i>In Vivo</i>	Repeat Dose Toxicity	Reproductive Toxicity	Developmental Toxicity
A	A	NR	A	SAR	A

Legend	
Symbol	Description
Test	Endpoint requirements to be fulfilled with testing
Calc	Endpoint requirement fulfilled based on calculated data
A	Endpoint requirement fulfilled with adequate existing data
NR	Not required per the OECD SIDS guidance
NA	Not applicable due to physical/chemical properties
SAR	Structure-Activity Relationship